

CLAIMS:

1. A vaso-occlusive device, comprising:

an elongate, flexible, filamentous inner element;

5 a non-metallic intermediate element coaxially surrounding the inner element
and in intimate contact therewith; and

an outer element coaxially surrounding the intermediate element and in
intimate contact therewith, the outer element defining a gap or opening through
which the intermediate element is exposed.

10 2. The vaso-occlusive device of Claim 1, wherein the inner element comprises
a microcoil made of a biocompatible material selected from the group consisting of
metal wire and polymeric filament.

15 3. The vaso-occlusive device of Claim 1, wherein the intermediate element
includes an expansile polymeric material

4. The vaso-occlusive device of Claim 1, wherein the outer element includes
an open-wound, helically-coiled portion that defines the gap or opening through
20 which the intermediate element is exposed.

5. The vaso-occlusive device of Claim 1, wherein the inner element has
proximal and distal ends, and wherein the device further comprises a coupling
element attached to the proximal end.

25 6. The vaso-occlusive device of Claim 3, wherein the expansile polymeric

material consists essentially of a hydrogel.

7. The vaso-occlusive device of Claim 6, wherein the hydrogel is of a type that expands in response to a change in an environmental parameter.

5

8. The vaso-occlusive device of Claim 7, wherein the environmental parameter is selected from the group consisting of temperature and pH.

9. The vaso-occlusive device of Claim 1, wherein the intermediate element,
10 when expanded, extends through the openings of the outer element to form an exterior surface having an undulating configuration defining a chain of convexly-curved arcuate segments.

10. The vaso-occlusive device of Claim 1, wherein the inner element has
15 proximal and distal ends, and wherein the outer element comprises an open-wound helical coil portion extending between proximal and distal end sections that are respectively attached to the inner element adjacent to the proximal and distal ends of the inner element, wherein the open-wound portion defines the gap or opening.

20 11. The vaso-occlusive device of Claim 10, wherein the proximal end section of the outer element includes a close-wound helical coil section.

12. The vaso-occlusive device of Claim 10, wherein each of the proximal and distal end sections of the outer element includes a close-wound helical coil section.

25

13. The vaso-occlusive device of Claim 11, further comprising a coupling

element attached to the proximal end of the inner element and to the proximal end section of the outer element.

14. A vaso-occlusive device comprising:

5 first, second, and third elongate, flexible elements arranged coaxially, wherein the first element is a filamentous inner element, the second element is an intermediate element, and the third element is an outer element having an opening or gap through which the intermediate element is exposed, and wherein at least one of the inner and intermediate elements is made at least in part of a non-metallic
10 biocompatible material.

15 15. The vaso-occlusive device of Claim 14, wherein the biocompatible material includes a bioactive agent.

16. The vaso-occlusive device of Claim 14, wherein the biocompatible material includes a therapeutic compound.

17. The vaso-occlusive device of Claim 14, wherein the inner element comprises a microcoil made of a biocompatible material selected from the group
20 consisting of metal wire and polymeric filament, and wherein the intermediate element is formed of a biocompatible polymeric material

18. The vaso-occlusive device of Claim 14, wherein the intermediate element includes an expansile polymeric material

25

19. The vaso-occlusive device of Claim 14, wherein the outer element

includes an open-wound, helically-coiled portion that defines the opening or gap through which the intermediate element is exposed.

20. The vaso-occlusive device of Claim 14, wherein the inner element has proximal and distal ends, and wherein the device further comprises a coupling element attached to the proximal end.

21. The vaso-occlusive device of Claim 18, wherein the expansile polymeric material consists essentially of a hydrogel.

22. The vaso-occlusive device of Claim 21, wherein the hydrogel is of a type that expands in response to a change in an environmental parameter.

23. The vaso-occlusive device of Claim 22, wherein the environmental parameter is selected from the group consisting of temperature and pH.

24. The vaso-occlusive device of Claim 14, wherein the intermediate element, when expanded, extends through the opening or gap of the outer element to form an exterior surface having an undulating configuration defining a chain of convexly-curved arcuate segments.

25. The vaso-occlusive device of Claim 14, wherein the inner element has proximal and distal ends, and wherein the outer element comprises an open-wound helical coil portion extending between proximal and distal end sections that are respectively attached to the inner element adjacent to the proximal and distal ends of the inner element, wherein the open-wound portion defines the opening or gap.

26. The vaso-occlusive device of Claim 25, wherein the proximal end section of the outer element includes a close-wound helical coil section.

5 27. The vaso-occlusive device of Claim 25, wherein each of the proximal and distal end sections of the outer element includes a close-wound helical coil section.

28. The vaso-occlusive device of Claim 26, further comprising a coupling element attached to the proximal end of the inner element and to the proximal end
10 section of the outer element.

29. A vaso-occlusive device, comprising:
an elongate, flexible, filamentous microcoil inner element;
an intermediate element coaxially surrounding the inner element and in
15 intimate contact therewith and formed essentially of an expansile polymer; and
a substantially non-expansile outer element coaxially surrounding the intermediate element and in intimate contact therewith, the outer element defining a gaps or opening through which the intermediate element is exposed;
wherein the intermediate element, when expanded, protrudes through the gap
20 or opening in the outer element and assumes a configuration with an undulating, convexly-curved outer surface defining a chain of arcuate segments, each having a diameter significantly greater than the diameter of the outer element.

30. The vaso-occlusive device of Claim 29, wherein the microcoil is made of a
25 biocompatible material selected from the group consisting of metal wire and polymeric filament.

31. The vaso-occlusive device of Claim 29, wherein the outer element includes an open-wound, helically-coiled portion that defines the gap or opening through which the intermediate element is exposed.

5

32. The vaso-occlusive device of Claim 29, wherein the inner element has proximal and distal ends, and wherein the device further comprises a coupling element attached to the proximal end.

10 33. The vaso-occlusive device of Claim 29, wherein the expansile polymeric material consists essentially of a hydrogel.

34. The vaso-occlusive device of Claim 33, wherein the hydrogel is of a type that expands in response to a change in an environmental parameter.

15

35. The vaso-occlusive device of Claim 34, wherein the environmental parameter is selected from the group consisting of temperature and pH.

20 36. The vaso-occlusive device of Claim 29, wherein the inner element has proximal and distal ends, and wherein the outer element comprises an open-wound helical coil portion extending between proximal and distal end sections that are respectively attached to the inner element adjacent to the proximal and distal ends of the inner element, wherein the open-wound portion defines the gap or opening.

25 37. The vaso-occlusive device of Claim 36, wherein the proximal end section of the outer element includes a close-wound helical coil section.

38. The vaso-occlusive device of Claim 36, wherein each of the proximal and distal end sections of the outer element includes a close-wound helical coil section.

- 5 39. The vaso-occlusive device of Claim 37, further comprising a coupling element attached to the proximal end of the inner element and to the proximal end section of the outer element.